UTAH DIVISION OF AIR QUALITY
SOURCE PLAN REVIEW

Doug Jones Nucor Steel PO Box 100 Plymouth, UT 84330	Project Number: N100080030
RE:	Modification of AO DAQE-AN100080031-13 to Increase Production and Add Equipment Box Elder County; CDS A; PSD, Nonattainment or Maintenance Area, Title V (Part 70) major source, NSPS (Part 60), MACT (Part 63),
Review Engineer:	Nando Meli Jr.
Date:	April 25, 2013
Notice of Intent Submitted:	June 25, 2012
Plant Contact:	Doug Jones
Phone Number:	(435) 458-2415
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Source Location:	West Nucor Rd, PO Box 100, Plymouth, UT Box Elder County 4637500 m Northing, 401000 m Easting, UTM Zone 12 UTM Datum: NAD27

DAQ requests that a company/corporation official read the attached draft/proposed Plan Review with Recommended Approval Order Conditions. If this person does not understand or does not agree with the conditions, the review engineer should be contacted within five days after receipt of the Plan Review. If this person agrees with the Plan Review and Recommended Approval Order Conditions, this person should sign below and return (FAX # 801-536-4099) within 10 days after receipt of the conditions. If the review engineer is not contacted within 10 days, the review engineer shall assume that the company/corporation official agrees with this Plan Review and will process the Plan Review towards final approval. A public comment period will be required before the Approval Order can be issued.

Applicant Contact ____

(Signature & Date)

OPTIONAL: In order for this Source Plan Review and associated Approval Order conditions to be administratively included in your Operating Permit (Application), the Responsible Official as defined in R307-415-3, must sign the statement below and the signature above is not necessary. THIS IS STRICTLY OPTIONAL!

If you do not desire this Plan Review to be administratively included in your Operating Permit (Application), only the Applicant Contact signature above is required. Failure to have the Responsible Official sign below will not delay the Approval Order, but will require a separate update to your Operating Permit Application or a request for modification of your Operating Permit, signed by the Responsible Official, in accordance with R307--415-5a through 5e or R307-415-7a through 7i.

> **"Based on reasonable inquiry, I certify that the information provided for this Approval Order has been true, accurate and complete and request that this Approval Order be administratively amended to the Operating Permit (Application)."**

Responsible Official ____
(Signature & Date)

Print Name of Responsible Official ____________________________________

ABSTRACT

Nucor Steel - Plymouth (Nucor) operates an Electric Arc Furnace (EAF) shop, commonly known as a minimill. The facility is a recycling center which utilizes scrap steel as a raw feedstock. Scrap steel is purchased from a number of sources and sorted. The steel is loaded into charge buckets and transported to one of two EAFs. Oxyfuel burners and electricity are used to melt the steel into a liquid. Alloys are added until the desired metallurgy is achieved. The molten material is then continuously molded and cut into billets for stockpiling. The billets are then reheated and transferred to the rolling mill to be shaped and shipped to the customer.

Nucor is requesting to modify their current AO, DAQE-AN100080031-13 to reflect proposed changes at the Plymouth plant. The changes will result in a significant increase in the PTE for PM10, PM2.5 and CO. The modifications include installing new pollution control equipment and new process equipment in the EAF shop. The airflows for the EAF baghouse will increase from an annual average flow rate of approximately 700,000 dscfm to an average annual flow rate of greater than 1,000,000 dscfm to better capture fugitive emissions within the meltshop. Nucor recently completed a review of their plant and identified that some of the emission sources that were not permitted, including steam vents that contain particulates and emissions associated with material handling. Nucor has also updated the emission factors used in the calculation of emissions at their plant. The modification included changes due to continuous improvement projects that have been previously permitted and continue to be installed in the melt shop operations.

The modifications will include
1) A new alloy unloading station adjacent to melt shop operations;
2) An abrasive saw baghouse vented to the atmosphere;
3) A jump mill baghouse vented to the atmosphere;
4) A Roll Mill 1 baghouse vented to the atmosphere;
5) Rolled product natural gas burner assisted heat retention boxes;
6) Three emergency generators;
7) Conversion of ladle stir stations to electrically powered LMFs;
8) A ladle vacuum degasser;
9) Increase flow rate through the EAF baghouse;
10) Emergency natural gas fired engines for EAF hydraulics;
11) An increase in hours of operation for the steel-making operations; and
12) An increase in EAF baghouse flow rates and production rates for the steel-making operations.

Nucor is located in Box Elder County which is a nonattainment area for $PM_{2.5}$. Nucor is a PSD source and a Title V source. This AO is being processed as an enhanced AO, and the Title V permit will be administratively amended after the AO is issued. Nucor is currently regulated by the New Source Performance Standard (NSPS) Subpart AAa (Standards for Steel Plants: Electric Arc Furnaces and Argon-Oxygen Decarburization Vessels Constructed after August 7, 1983).

The PTE emissions (in TPY) will change as follows: PM_{10} (including $PM_{2.5}$) = +33.63, $PM_{2.5}$ = +32.10, NO_x = 9.29, SO_2 = +4.97, CO = +51.21, VOC = +2.31, HAPs = +1.29, and CO2e = +43,989.60. The new PTE (in TPY) will be as follows: PM_{10}(including $PM_{2.5}$) = 162.66, $PM_{2.5}$ (filterable) = 144.01, NO_x = 350.62, SO_2 = 336.70, CO = 3,023.88, VOC = 139.02 and HAPs = 16.75, and CO_2e = 150,000. Nucor is located in a nonattainment area and Appendix S of 40 CFR Part 51 requires offsets for actual to PTE emission increases for pollutants in nonattainment and their precursors. This includes PM2.5 and SO2 for

this nonattainment area. The increase in actual emissions to PTE that will be offset will be as follows: 108.46 tpy for $PM_{2.5}$ and 286.25 tpy for SO_2.

SOURCE SPECIFIC DESIGNATIONS

Applicable Programs:

NSPS (Part 60), Subpart A: General Provisions applies to Nucor Plymouth Bar Mill Group

NSPS (Part 60), Subpart AA: Standards of Performance for Steel Plants: Electric Arc Furnaces Constructed After October 21, 1974, and On or Before August 17, 1983 applies to Nucor Plymouth Bar Mill Group

NSPS (Part 60), Subpart IIII: Standards of Performance for Stationary Compression Ignition Internal Combustion Engines applies to Nucor Plymouth Bar Mill Group

NSPS (Part 60), Subpart JJJJ: Standards of Performance for Stationary Spark Ignition Internal Combustion Engines applies to Nucor Plymouth Bar Mill Group

MACT (Part 63), Subpart A: General Provisions applies to Nucor Plymouth Bar Mill Group

MACT (Part 63), Subpart ZZZZ: National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines applies to Nucor Plymouth Bar Mill Group

MACT (Part 63), Subpart YYYYY: National Emission Standards for Hazardous Air Pollutants for Area Sources: Electric Arc Furnace Steelmaking Facilities applies to Nucor Plymouth Bar Mill Group

MACT (Part 63), Subpart CCCCCC: National Emission Standards for Hazardous Air Pollutants for Source Category: Gasoline Dispensing Facilities applies to Nucor Plymouth Bar Mill Group

PSD applies to Nucor Plymouth Bar Mill Group

Title V (Part 70) major source applies to Nucor Plymouth Bar Mill Group

Salt Lake City $PM_{2.5}$ NAA applies to the area of Box Elder County that Nucor Plymouth Bar Mill Group is located in.

Permit History:

When issued, the approval order shall supersede or will be based on the following documents:

Supersedes	DAQE-AN100080031-13 dated March 18, 2013
Incorporates	Notice of Intent dated June 25, 2012
Incorporates	Additional Information dated February 14, 2013
Incorporates	Additional Information dated February 27, 2013
Incorporates	Additional Information dated March 1, 2013
Incorporates	Additional Information dated April 18, 2013
Incorporates	Additional Information dated April 16, 2013
Incorporates	Additional Information dated April 13, 2013

Incorporates	Additional Information dated April 7, 2013
Incorporates	Additional Information dated April 4, 2013
Incorporates	Additional Information dated March 9, 2013

Nonattainment or Maintenance Areas Impacted:
Box Elder County $PM_{2.5}$ NAA

SUMMARY OF NOTICE OF INTENT INFORMATION

Description of Proposal:

Description in Reviewer Comments section.

Summary of Emission Totals:

The emissions listed below are an estimate of the total potential emissions from the source. Some rounding of emissions is possible.

Estimated Criteria Pollutant Potential Emissions		
CO_2 Equivalent	150000.00	tons/yr
Carbon Monoxide	3023.88	tons/yr
Nitrogen Oxides	350.62	tons/yr
Particulate Matter - PM_{10}	162.66	tons/yr
Particulate Matter - $PM_{2.5}$	141.54	tons/yr
Particulate Matter - $PM_{2.5}$ (Fugitives)	144.01	tons/yr
Sulfur Dioxide	336.70	tons/yr
Volatile Organic Compounds	139.02	tons/yr

Estimated Hazardous Air Pollutant Potential Emissions		
Total HAPs (CAS #THAPS)	16.75	tons/yr
Total hazardous air pollutants	16.75	tons/yr

Review of Best Available Control Technology:

1. BACT review regarding BACT/LAER Evaluation
   Nucor is located in a nonattainment area for $PM_{2.5}$ and the $PM_{2.5}$ precursor SO_2. A LAER analysis was performed on these two pollutants and BACT was performed on all other pollutants that were increased.

   The BACT analysis submitted by Nucor Steel follows the top-down approach that is approved by EPA. This BACT analysis was very through. In the top-down approach, all options that are available to control a pollutant are identified. Then each option is evaluated for technical feasibility. If the option being presented is designated as being infeasible, it is eliminated from any further consideration. The remaining feasible options are ranked in order based on the level of control effectiveness. These options are then evaluated and the final option is selected as BACT. This evaluation is based on the environmental, energy and economic impacts.

DAQ reviewed this BACT analysis and verified the claims made by Nucor. This was done by reviewing EPA's RACT/BACT/LAER Clearinghouse and other permits issued to different sites with EAFs, such as
Republic Steel (Ohio) permit number P0109191 dated July 7, 2012
Timken Company (Ohio) permit number P0105790 dated December 29, 2010
Timken Company (Ohio) P0104388 dated December 29, 2010
Steel Dynamics (Indiana) 063-27213-00037 dated March 3, 2010.

Nucor is not modifying the operation of the EAF that is allowed by the previous AO and Title V permit, but is increasing the hours of operation for the EAF. The emissions increase is also coming from the increase in the flow rate from the EAF baghouse, conversion of the ladle stir station to a powered ladle station, an addition of a vacuum degasser, added roll mill baghouses, installation of natural gas and diesel combustion equipment, and added material handling operations.

A LAER analysis is required for the EAF baghouse $PM_{2.5}$ and SO_2 emissions and the roll mill baghouse $PM_{2.5}$ emissions. These LAER reviews are listed first but are titled as BACT review and the sources requiring only a BACT analysis are listed after the LAER reviews. [Last updated April 15, 2013]

2. BACT review regarding EAF $PM_{2.5}$ Control

Step 1—Identify All Control Technologies. Baghouses, Electrostatic Precipitators (ESP) and scrubbers are used to control PM emissions.

Step 2—Eliminate Technically Infeasible Options. In the steel industry, there are generally two principal capture systems employed during EAF operation to control the process emissions generated during melting and refining. One is the Direct Evacuation Control (DEC) system and the other is the side draft hood system. Side draft hoods require higher air flow rates than a DEC system and are not widely used. Based upon a review of the previously listed information resources, DEC system continues to be the primary control technology for capturing emissions from an EAF. Fabric filtration is the predominant control option for abatement of particulate emissions (PM, PM_{10}, $PM_{2.5}$) from an EAF application. Other particulate control options are not considered as effective or technically feasible for an EAF application. Based on a review of the information resources, it was revealed that these control alternatives have not been successfully implemented to reduce particulate emissions from EAFs. The remaining control options were determined to be technically infeasible.

Step 3—Rank Remaining Control Technologies by Control Effectiveness. Only a single control option was ascertained to be technically feasible. So no ranking of control alternatives has been provided.

Step 4—Evaluate Most Effective Controls and Document Results. The New Source Performance Standard (NSPS) and NESHAP for particulate matter emissions from an EAF are both 0.0052 grains/dscf. A review of the RBLC database revealed that EAFs have a PM_{10} limit of 0.0018 gr/dscf (filterable). One source that burned tires had a PM_{10} limit of 0.0017 gr/dscf. Nucor's present limits are PM of 25.07 lbs/hr and 0.0030 grains/dscf and PM_{10} of 20.06 lbs/hr and 0.0024 gr/dscf.

$PM_{2.5}$ emissions from the electric arc furnaces are generally identical to PM_{10} emissions. As indicated in AP-42 (Iron and Steel Production, Table 12.5-2), the particle size distribution for particulate matter emission from an EAF controlled by a baghouse shows that 76 percent of the emissions are PM_{10} and less and 74 percent of the emissions are $PM_{2.5}$ and less. Thus, the $PM_{2.5}$ emissions from the baghouse are estimated to be 97.4 percent (74/76) of the PM_{10} emissions.

The New Source Review section recommends that baghouse with a PM_{10} emission rate of 0.0018 gr/dscf (filterable) and a $PM_{2.5}$ emission rate of 0.00176 gr/dscf (filterable) and 0.0052 gr/dscf (filterable plus condensibles) be accepted as LAER with an opacity limit of less than 3%. [Last updated April 15, 2013]

3. BACT review regarding EAF SO_2 Control

The source of SO_2 emissions from the EAF is attributable to the sulfur content of the raw materials charged in the EAF, materials which will be blown into the foaming slag process, and to a much lesser extent, the sulfur content of oil on the scrap steel.

Step 1—Identify All Control Technologies.

A. Lower-Sulfur Charge Substitution

B. Flue Gas Desulfurization (FGD) options

a. Wet Scrubbing

b. Spray Dryer Absorption (SDA) or

c. Dry Sorbent Injection (DSI).

Step 2—Eliminate Technically Infeasible Options. The test for technical feasibility of any control option is whether it is both available and applicable to reducing SO_2 emissions from the EAF

Lower-Sulfur Charge Substitution - Charge substitution with lower sulfur-bearing raw materials is not practical due to inconsistent availability. Low sulfur injection carbon and charge carbon has been used in the steel making process, however, these materials are not always available. A summary of the charge materials is set forth below.

Due to market conditions, the continued availability of low sulfur carbon sources used in the steel mill in the past is increasingly in question. Petroleum coke sulfur concentrations are increasing and low sulfur petroleum cokes are essentially unavailable. Metallurgical coke is limited in supply, not useable as an injection carbon, and is used for other critical industrial operations besides steelmaking, making it difficult to consistently obtain. Bituminous coals are largely unsuited to steelmaking, leaving anthracite as the remaining major source. Anthracite sulfur concentrations are also increasing and the supply of the lower sulfur coals is diminishing both domestically and in the world market. Therefore, continued availability of low sulfur sources of carbon cannot be assured.

The fixed carbon is another important variable. As the percent of fixed carbon diminishes, correspondingly more of the carbon source must be used to achieve the same result. Currently the lower sulfur coals and cokes decreasing in availability. SO_2 is variable according to scrap feed. The present short term SO_2 emission limits from the melt shop baghouse will remain unchanged.

Flue Gas Desulfurization -- FGD systems currently in use for SO_2 abatement can be classified as wet and dry systems. At the present time the control technologies for SO_2 abatement have not been successfully implemented for EAFs.

Wet Scrubbing -- Wet scrubbers are regenerative processes which are designed to maximize contact between the exhaust gas and an absorbing liquid. The exhaust gas is scrubbed with a 5 - 15 percent slurry, comprised of lime (CaO) or limestone (CaCO3) in suspension. The SO_2 in the exhaust gas reacts with the CaO or CaCO3 to form calcium sulfite ($CaSO_3.2H_2O$) and calcium sulfate ($CaSO_4$). The scrubbing liquor is continuously recycled to the scrubbing tower after fresh lime or limestone has been added.

The types of scrubbers which can adequately disperse the scrubbing liquid include packed towers, plate or tray towers, spray chambers, and venturi scrubbers. In addition to calcium sulfite/sulfate, numerous other absorbents are available including sodium solutions and ammonia-based solutions.

There are various potential operating problems associated with the use of wet scrubbers. First, particulates are not acceptable in the operation of wet scrubbers because they would plug spray nozzles, packing, plates and trays. Thus, the scrubber would have to be located downstream of the EAF baghouse. The volumetric exhaust gas flow rate from the EAF will be approximately 1,400,000 dscfm. When coupled with the relatively low SO_2 emission rates, a relatively small SO_2 concentration of around 1-20 ppmv will result in the exhaust. The SO_2 concentration will also vary widely over the EAF cycle which operate as a batch process. This will preclude efficient application of wet scrubbing. [Last updated April 19, 2013]

4. BACT review regarding EAF SO_2 Control Continued

After reviewing the RBLC database it was noted that control technologies for SO_2 abatement have not been successfully implemented for EAFs. The possibility of water in the baghouse is a major operating problem, which would allow the dust to form into hard cement in the baghouse hoppers cause the bags to blend with the caked dust. This would then lead to opacity problems and broken dust augers in the baghouse. Due to the large gas flows, the equipment would have to be over-sized with care for corrosion resistance.

Spray Dryer Absorption (SDA) -- An alternative to wet scrubbing is a process known as dry scrubbing, or spray-dryer absorption (SDA). As in wet scrubbing, the gas-phase SO_2 is removed by intimate contact with a suitable absorbing solution. Typically, this may be a solution of sodium carbonate (Na2CO3) or slaked lime [Ca(OH)2]. In SDA systems the solution is pumped to rotary atomizers, which create a spray of very fine droplets. The droplets mix with the incoming SO_2-laden exhaust gas in a very large chamber and subsequent absorption leads to the formation of sulfites and sulfates within the droplets. Almost simultaneously, the sensible heat of the exhaust gas which enters the chamber evaporates the water in the droplets, forming a dry powder before the gas leaves the spray dryer. The temperature of the desulfurized gas stream leaving the spray dryer is now approximately 30 – 50 degrees F above its dew point.

The exhaust gas from the SDA system contains a particulate mixture which includes reacted products. Typically, baghouses employing Teflon-coated fiberglass bags (to minimize bag corrosion) are utilized to collect the precipitated particulates. The SDA process has never been proposed nor successfully implemented for similar steel mill applications. In view of the above limitations, the SDA dry scrubbing option is considered technically infeasible for this application.

Dry Sorbent Injection (DSI) -- This control option typically involves the injection of dry powders into either the furnace or post-furnace region of utility-sized boilers. This process was developed as a lower cost option to conventional FGD technology. Since the sorbent is injected directly into the exhaust gas stream, the mixing offered by the dry scrubber tower is not realized. In addition to the issues that are similar to the SDA, there are significant concerns about handling, treatment and disposal of large amounts of dry solid wastes which have the potential of being classified as hazardous wastes. Moreover DSI has never been proposed nor successfully implemented for similar steel mill applications. In view of the above limitations, the DSI dry scrubbing option is considered technically infeasible for this application.

With the exception of a scrap management program, the applicability of the remaining control options are determined to be technically infeasible.

Step 3—Rank Remaining Control Technologies by Control Effectiveness. Only a single control option was ascertained to be technically feasible. So no ranking of control alternatives has been provided.

Step 4—Evaluate Most Effective Controls and Document Results. None of the steel mills reviewed in this analysis have proposed or successfully implemented any controls besides scrap management. The other control options have been shown to be technically infeasible. [Last updated April 5, 2013]

5. BACT review regarding EAF SO_2 Control Continued
A review of the RBLC database revealed that plants with a comparable size EAF have an SO_2 limit of 0.39 lb SO_2/ton of steel produced (150 ton steel/hr and 1.3 MM ton steel/yr Republic Steel), 0.44 lb SO_2/ton of steel produced with tire burning and 0.070 without tire burning (0.4 MMton steel/yr Timken) and 0.52 lb SO_2/ton of steel produced with tire burning and 0.15 without tire burning (1.3 MMton steel/yr Timken). These plants are specialty plants and use a higher scrap grade of steel than what Nucor uses. In addition, plants of this type generally are not 100% scrap steel recyclers and rely on pure iron substitutes such as DRI or Pig Iron to meet quality requirements. This accounts for the lower emission rates.
Nucor's present limits are PM of 25.07 lbs/hr and 0.0030 grains/dscf and PM_{10} of 20.06 lbs/hr and 0.0024 gr/dscf. Nucor's application includes peak production rates of 180.7 ton steel/hr. 194.96 lb SO_2/hr / 180.7 ton steel/hr = 1.079 lb SO_2/ton of steel. Nucor also presently has an annual limit of 322 tons per year.
The New Source Review section recommends that scrap management be accepted as LAER for the control of the EAF SO_2 emissions with a decreased allowed emission rate of 0.52 lb SO_2/ton of steel. This equates to a decreased allowed emission rate of 93.98 lb/hr of SO_2 at 180.7 ton steel per hour. With an opacity limit of less than 3%. [Last updated April 12, 2013]

6. BACT review regarding $PM_{2.5}$ Emissions from Roll Mill Operations.
Step 1—Identify All Control Technologies. Baghouses are the predominant control for dry PM emissions.
Step 2—Eliminate Technically Infeasible Options. The remaining control options were determined to be technically infeasible.
Step 3—Rank Remaining Control Technologies by Control Effectiveness. Only a single control option was ascertained to be technically feasible. So no ranking of control alternatives has been provided.
Step 4—Evaluate Most Effective Controls and Document Results. Since fabric filters represent the most effective particulate control technique, and since fabric filters are proposed, no further evaluation is warranted.
The New Source Review section recommends that baghouses be accepted as LAER for $PM_{2.5}$ emissions from the Roll Mill with an opacity limit of 10%. [Last updated April 5, 2013]

7. BACT review regarding EAF NO_x Control
Step 1—Identify All Control Technologies.
   A. Combustion Controls;
      a. Low Excess Air (LEA);
      b. Oxyfuel Burner;
      c. Overfire Air (OFA);
      d. Burners Out Of Service (BOOS);
      e. Reduced Combustion Air Temperature;
      f. Load Reduction; and
      g. Flue Gas Recirculation (FGR)
   B. Selective Catalytic Reduction (SCR);
   C. Non-Selective Catalytic Reduction (NSCR);
   C. SCONO$_x$ Catalytic Oxidation/Absorption;
   D. Shell DeNO$_x$ System (modified SCR);

E. Selective Non-Catalytic Reduction (SNCR) options -

Step 2—Eliminate Technically Infeasible Options. Various control alternatives were reviewed for technical feasibility in controlling NO_x emissions from the EAF.

The LEA option is typically used in conjunction with some of the other options. The use of this option will result in the generation of additional CO emissions, which is another pollutant under review of this BACT analysis. In addition, LEA is not very effective for implementation in electric arc furnaces which do not operate with combustion air feeds, since the combustion process is not modulated with the near-atmospheric furnace conditions. Thus, this option is considered technically infeasible for this application.

The existing EAF system does employ natural gas-fired oxyfuel burners.

The OFA option is geared primarily for fuel NO_x reduction, which is not the major NO_x formation mechanism from EAFs. Thus, this option is considered technically infeasible for this application.

The BOOS and Load Reduction (or Deration) options incorporate a reduction in furnace load, thereby, potentially reducing NO_x formation. This reduction must be balanced, however, against a longer period of NO_x generation resulting from the furnace's inability to efficiently melt scrap and scrap substitutes. Furthermore, both BOOS and Load Reduction are fundamentally inconsistent with the design criterion for the furnace, which is to increase furnace loadings to achieve enhanced production. Accordingly, these options are judged technically infeasible for this particular application.

The Reduced Combustion Air Temperature option inhibits thermal NO_x production. However, the option is limited to equipment with combustion air preheaters which are not applicable to EAFs. Thus, this option is considered technically infeasible for this application .

The FGR option involves recycling a portion of the cooled exit flue gas back into the primary combustion zone. Typically, FGR is useful in reducing thermal NO_x formation by lowering the oxygen concentration in the combustion zone. The primary limitation of FGR is that it alters the distribution of heat (resulting in cold spots) and lowers the efficiency of the furnace. Since it may be necessary to add additional burners (hence, increasing emissions of other pollutants) to the EAF to reduce the formation of cold spots, FGR technology to reduce EAF NO_x emissions is not considered feasible. [Last updated April 5, 2013]

8. BACT review regarding EAF NO_x Control Continued

Selective Catalytic Reduction (SCR) -- In this process, ammonia (NH_3), usually diluted with air or steam, is injected through a grid system into the exhaust gas stream upstream of a catalyst bed. On the catalyst surface the NH_3 reacts with NO_x to form molecular nitrogen and water. The reactions take place on the surface of the catalyst. Performance for a given catalyst depends largely on the temperature of the exhaust gas stream being treated. In order for an SCR system to effectively reduce NO_x emissions, the exhaust gas stream should have relatively stable gas flow rates, NO_x concentrations, and temperature. The temperature of the EAF exhaust gas will vary widely over the melt cycle, and the gas flow rates and NO_x concentrations will exhibit a wide amplitude. Moreover, the presence of particulates in the exhaust gas prior to the EAF baghouse may result in fouling of the catalyst, rendering it ineffective. Also, the SCR system cannot be installed after particulate removal in the EAF baghouse due to unacceptably low temperatures outside the effective operating range. In addition, certain elements such as iron, nickel, chrome, and zinc can react with platinum catalysts to form compounds or alloys which are not catalytically active. These reactions are termed "catalytic poisoning", and can result in premature replacement of the catalyst. An EAF flue gas may contain a number of these catalytic poisons. In addition, any solid material in the gas stream can form deposits and result in fouling or masking of the catalytic surface. Due to the above effective technical applicability constraints, SCR technology has never been applied to EAF operations. In view of the above limitations, the SCR option is considered technically infeasible with unresolved technical issues and significant environmental impacts.

Non-Selective Catalytic Reduction (NSCR) -- The NSCR system is a post-combustion add-on exhaust gas treatment system. In order to operate properly, the combustion process must be stoichiometric or near-stoichiometric which is not maintained in an EAF and varies widely under regular operation. Currently, NSCR systems are limited to rich-burn IC engines with fuel rich ignition system applications. Moreover, potential problems with NSCR systems include catalyst poisoning by oil additives such as phosphorus and zinc (present in galvanized scrap steel charged in the EAF). In view of the above limitations, the NSCR option is considered technically infeasible for this application.

$SCONO_x$-Catalytic Oxidation/Absorption -- This is a catalytic oxidation/absorption technology that has been applied for reductions of NO_x, CO and VOC from an assortment of combustion applications that mostly include – small turbines, boilers and lean burn engines. However, this technology has never been applied for steel mill EAFs. The technology is not readily adaptable to high temperature applications outside the 300 700 oF range and is susceptible to thermal cycling that will be experienced in the Nucor application. The technology has not been demonstrated for larger applications. Optimum $SCONO_x$ operation is predicated by stable gas flow rates and the nature of EAF operations do not afford any of these. The catalyst is susceptible to moisture. The K2CO3 coating on the catalyst surface is an active chemical reaction and reformulation site which makes it particularly vulnerable to fouling. In view of the above limitations, $SCONO_x$ is considered technically infeasible for the present application [Last updated April 5, 2013]

9. BACT review regarding EAF NO_x Control Continued

Shell $DeNO_x$ System (modified SCR) -- The Shell $DeNO_x$ system is a variant of traditional SCR technology which utilizes a high activity dedicated ammonia oxidation catalyst based on a combination of metal oxides. The Shell $DeNO_x$ technology can not only operate at a lower temperature but also have a lower pressure drop penalty. The low temperature operation is the only aspect of the Shell $DeNO_x$ technology that marks its variance from traditional SCR technology. From an EAF application standpoint, there are no additional differences between this technology and SCR technology. The Shell $DeNO_x$ option is considered technically infeasible with unresolved technical issues and significant environmental impacts for this application.

Selective Non-Catalytic Reduction (SNCR) -- The three commercially available SNCR systems are Exxon's Thermal $DeNO_x$® system,
Nalco Fuel Tech's NO_xOUT® system and
Low Temperature Oxidation (LTO). Exxon's Thermal $DeNO_x$® - Exxon's Thermal $DeNO_x$® system is a non-catalytic process for NO_x reduction. The process involves the injection of gas-phase ammonia (NH_3) into the exhaust gas stream to react with NO_x. In order for the Thermal $DeNO_x$® system to effectively reduce NO_x emissions, the exhaust gas stream should have relatively stable gas flow rates; ensuring the required residence time and be within the prescribed temperature range. This technology is considered technically infeasible.

Nalco Fuel Tech's NOXOUT® - The NO_xOUT® process is very similar in principle to the Thermal $DeNO_x$® process, except that it involves the injection of a liquid urea (NH2CONH2) compound (as opposed to NH_3) into the high temperature combustion zone to promote NO_x reduction. As with the Thermal DeNO$_x$® system, the NO$_x$OUT® system suffers from essentially similar limitations to effectively reduce NO_x emissions from EAF operations. The applications of the NO$_x$OUT® technology to control NO_x emissions from steel mill EAF operations are not known.

Low Temperature Oxidation (LTO) -- LTO technology has never been utilized for any steel mill EAF application. The vendor has listed applications for mostly industrial boilers and cogeneration gas turbines which have a more favorable energy balance. The technology is neither applicable nor proven for steel mill EAF applications and attendant limitations render it technically infeasible in its current manifestation. In view of the above, the LTO control option is considered technically infeasible for this application

With the exception of combustion control utilizing existing natural gas-fired oxyfuel burners, the applicability of the remaining control options are considered technically infeasible.

Step 3—Rank Remaining Control Technologies by Control Effectiveness. Only a single control option was ascertained to be technically feasible. So no ranking of control alternatives has been provided.

Step 4—Evaluate Most Effective Controls and Document Results. Since natural gas-fired oxyfuel burners represent the most effective particulate control technique, and since natural gas-fired oxyfuel burners are proposed, no further evaluation is warranted.

The New Source Review section recommends that natural gas-fired oxyfuel burners be accepted as BACT for the EAF. [Last updated April 5, 2013]

10. BACT review regarding EAF VOC Control

Step 1—Identify All Control Technologies. Catalytic or Thermal Oxidation; Degreasing of scrap metal prior to charging in the EAF; and Scrap management program.

Step 2—Eliminate Technically Infeasible Options. With the exception of a scrap management program, the applicability of the remaining control options were determined to be technically infeasible.

Step 3—Rank Remaining Control Technologies by Control Effectiveness. Only a single control option was ascertained to be technically feasible. So no ranking of control alternatives has been provided.

Step 4—Evaluate Most Effective Controls and Document Results. None of the steel mills reviewed in this analysis have proposed or successfully implemented any controls besides scrap management. The other control options have been shown to be technically infeasible.

The New Source Review section recommends that scrap management be accepted as BACT for the EAF VOC emissions. [Last updated April 5, 2013]

11. BACT review regarding EAF CO Control

Step 1—Identify All Control Technologies. Operating Practice Modifications; Flaring of CO Emissions; CO Oxidation Catalysts; Post-Combustion Reaction Chamber; Catalytic Incineration; Oxygen Injection; and Direct Evacuation Control (DEC).

Step 2—Eliminate Technically Infeasible Options. Various control alternatives were reviewed for technical feasibility in controlling CO emissions from the EAF and none of the control options were determined to be technically feasible. No other mills have proposed or successfully implemented any controls besides DEC and post combustion.

Step 3—Rank Remaining Control Technologies by Control Effectiveness. Only a single control option was ascertained to be technically feasible. So no ranking of control alternatives has been provided.

Step 4—Evaluate Most Effective Controls and Document Results. Since DEC and post

combustion control represent the most effective particulate control technique, no further evaluation is warranted.
The New Source Review section recommends that DEC and post combustion control be accepted as BACT for the EAF. [Last updated April 5, 2013]

12. BACT review regarding EAF Pb Control
Step 1—Identify All Control Technologies. Pb emissions from the EAF are captured by the DEC and a roof exhaust system. The emissions are then exhausted to the EAF baghouse.
Step 2—Eliminate Technically Infeasible Options. The remaining control options were determined to be technically infeasible.
Step 3—Rank Remaining Control Technologies by Control Effectiveness. Only a single control option was ascertained to be technically feasible. So no ranking of control alternatives has been provided.
Step 4—Evaluate Most Effective Controls and Document Results. A review of the Ract/Bact LAER Clearinghouse (RBLC) database revealed that other steel mills have a similar Pb controls. None of the steel mills reviewed in this analysis have proposed or successfully implemented any controls besides fabric filtration.
The New Source Review section recommends that a DEC system exhausted through a baghouse be accepted as BACT for the control of Pb from the EAF with an opacity limit of less than 3%. [Last updated April 5, 2013]

13. BACT review regarding Natural Gas-Fired Generators
Step 1—Identify All Control Technologies. Review of the RBLC revealed that no add on controls was available for generators of this size.
Step 2—Eliminate Technically Infeasible Options. The remaining control options were determined to be technically infeasible.
Step 3—Rank Remaining Control Technologies by Control Effectiveness. Control options were determined to be technically infeasible. So no ranking of control alternatives has been provided.
Step 4—Evaluate Most Effective Controls and Document Results. Since no controls are practical, no further evaluation is warranted.
The New Source Review section recommends that using natural gas as a fuel with good combustion practices be accepted as BACT for $PM_{2.5}$, SO_2 and NO_x emissions from the natural gas-fired emergency generators with an opacity limit of 10%. [Last updated April 5, 2013]

14. BACT review regarding Diesel-Fired Emergency Generators
Step 1—Identify All Control Technologies. No add on controls have been identified for diesel-fired emergency generators of this size. The generators location prevents the use of natural gas, so the use of ultra-low sulfur diesel is the only viable option.
Step 2—Eliminate Technically Infeasible Options. The remaining control options were determined to be technically infeasible.
Step 3—Rank Remaining Control Technologies by Control Effectiveness. Only a single control option was ascertained to be technically feasible. So no ranking of control alternatives has been provided.
Step 4—Evaluate Most Effective Controls and Document Results. Since no controls are practical, no further evaluation is warranted.
The New Source Review section recommends that using ultra low sulfur diesel with good combustion practices be accepted as BACT for $PM_{2.5}$ and SO_2 emissions from the diesel-fired emergency generators with an opacity limit of 20%. [Last updated April 5, 2013]

15. BACT review regarding Heat Retention Boxes
Step 1—Identify All Control Technologies. Review of the RBLC did not reveal any add on controls.
Step 2—Eliminate Technically Infeasible Options. The remaining control options were determined to be technically infeasible.
Step 3—Rank Remaining Control Technologies by Control Effectiveness. No additional controls was ascertained to be technically feasible. So no ranking of control alternatives has been provided.
Step 4—Evaluate Most Effective Controls and Document Results. Since no controls are practical, no further evaluation is warranted.
The New Source Review section recommends that using natural gas-fired burners with good combustion practices be accepted as BACT for $PM_{2.5}$ and NO_x emissions from the natural gas-fired heat retention boxes and dryers with an opacity limit of 10%. [Last updated April 5, 2013]

Modeling Results:

A dispersion modeling analysis was performed for the following source:
Company: Nucor Steel
Site: Plymouth Utah Steel Mill

The individual criteria emission increases triggered the requirement to model under R307-410-4 for the following pollutants:
-NO_2
-SO_2
-PM_{10}
-$PM_{2.5}$
-CO

The following table provides a comparison of the predicted impact plus background (total) with the National Ambient Air Quality Standards (NAAQS). The predicted total concentrations are less than their respective NAAQS.

Pollutant	Average	Impact ug/cu.m	Total ug/cu.m	NAAQS ug/cu.m	Percent NAAQS
NO_2	1-Hour	60.6	169.0	189	89.4%
NO_2	Annual	5.9	38.8	100	38.8%
SO_2	1-Hour	129.6	159.3	195	81.7%
SO_2	3-Hour	66.2	80.9	365	22.2%
SO_2	Annual	1.1	9.1	80	11.4%
PM_{10}	24-Hour	43.0	143.0	150	95.4%
$PM_{2.5}$	24-Hour	13.3	34.3	35	97.9%
$PM_{2.5}$	Annual	4.7	10.0	15	66.7%
CO	1-Hour	133.0	133.0	10000	1.3%
CO	8-Hour	777.0	777.0	40000	1.9%

Notes:

Modeling was completed for higher emission rates of SO_2 from the EAF baghouse The LAER review has found that a decrease in SO_2 short term rates from the modeled levels are required.

Nucor is located in an area that has been designated as nonattainment for $PM_{2.5}$.
Nucor completed modeling for this pollutant for informational purposes.

The rule does not set a percentage cutoff value where post construction monitoring is triggered. The rule, 40 CFR 52.21, states that it is the Director's discretion to decide if monitoring should be performed.
40CFR 52.21 ... (2) Post-construction monitoring. The owner or operator of a major stationary source or major modification shall, after construction of the stationary source or modification, conduct such ambient monitoring as the Administrator determines is necessary to determine the effect emissions from the stationary source or modification may have, or are having, on air quality in any area. [Last updated April 15, 2013]

RECOMMENDED APPROVAL ORDER CONDITIONS

The intent is to issue an air quality Approval Order (AO) authorizing the project with the following recommended conditions and that failure to comply with any of the conditions may constitute a violation of the AO. The AO will be issued to and will apply to the following:

Name of Permittee:	**Permitted Location:**
Nucor Steel PO Box 100 Plymouth, UT 84330	Nucor Steel: Nucor Steel West Nucor Rd PO Box 100 Plymouth, UT 84330

UTM coordinates: 401000 m Easting, 4637500 m Northing, UTM Zone 12
SIC code: 3312 (Steel Works, Blast Furnaces (Including Coke Ovens), & Rolling Mills)

Section I: GENERAL PROVISIONS

I.1 The limits set forth in this AO shall not be exceeded without prior approval. [R307-401]

I.2 Modifications to the equipment or processes approved by this AO that could affect the emissions covered by this AO must be reviewed and approved. [R307-401-1]

I.3 All records referenced in this AO or in other applicable rules, which are required to be kept by the owner/operator, shall be made available to the Director or Director's representative upon request, and the records shall include the five-year period prior to the date of the request. Unless otherwise specified in this AO or in other applicable state and federal rules, records shall be kept for a minimum of five (5) years. [R307-415-6a]

I.4 At all times, including periods of startup, shutdown, and malfunction, owners and operators shall, to the extent practicable, maintain and operate any equipment approved under this AO, including associated air pollution control equipment, in a manner consistent with good air pollution control practice for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the Director which may include, but is not limited to, monitoring results, opacity observations, review of operating and maintenance procedures, and inspection of the source. All maintenance performed on equipment authorized by this AO shall be recorded. [R307-401-4]

I.5 The owner/operator shall comply with R307-150 Series. Inventories, Testing and Monitoring. [R307-150]

I.6 The owner/operator shall comply with UAC R307-107. General Requirements: Breakdowns. [R307-107]

I.7 All definitions, terms, abbreviations, and references used in this AO conform to those used in the UAC R307 and 40 CFR. Unless noted otherwise, references cited in these AO conditions refer to those rules. [R307-101]

Section II: SPECIAL PROVISIONS

II.A The approved installations shall consist of the following equipment:

II.A.1 **Nucor Plymouth Bar Mill Group**

Electric Arc Furnace Steel Mill

II.A.2 **Melt Shop Equipment and Operations**

Two carbon electrode furnaces, equipped with natural gas oxy-fuel fired burners and oxygen lances, flux/carbon addition and injection systems, Direct Evacuation Control (DEC) and ancillary equipment (ladles, cranes, etc.) evacuated to a EAF fabric filter baghouse. Melt shop operations include: skull lancing; ladle preheaters; tundish preheaters; ladle/ tundish demolition, reconstruction, rebricking and torching.

II.A.3 **Melt Shop Equipment and Operations Continued**

The furnaces and associated support equipment may be modified by installation of eccentric bottom tap(s); sidewall and door oxygen lance burner technologies and/or door lancing technologies; alterations in furnace movements including roof swings and tilt mechanisms; and associated components; water cooling system improvements; computer control equipment, refractories, and alterations to raw material feeds such as alloy addition in wire and in bulk, and support equipment modifications.

II.A.4 **Melt Shop Equipment and Operations Continued**

Support Equipment modification include charge bucket, ladle, crane, electrical transformers, and structure modifications and building modifications. Improved maintenance practices associated with the furnaces will be implemented for the purposes of minimizing lost time associated with equipment breakdowns.

II.A.5 **Caster and associated equipment**

Continuous casting system with provisions for alloy addition; supplemental oxygen injection heating; backup alloy stir station; and automatic and manual torching operations to cut billets to length evacuated to melt shop baghouse. All modifications to the EAFs and casting systems, or improved maintenance practices, are to be completed for the purpose of increasing production rates as a continuous program of construction, not to exceed AO production limits and emission limits.

II.A.6 **Caster and associated equipment Continued**

The caster and associated equipment may be modified by: increasing or varying the number of strands; modifications to ladle handling or manipulation systems; ladle stirring; tundish modifications; slag system modifications; alloy addition modifications; casting speed; mold size and shape modifications, and; liquid steel washout capture systems. Improved maintenance practices at the caster will be implemented for the purposes of minimizing lost time associated with equipment breakdowns.

II.A.7 **Storage silos**

A. One storage silo for EAF baghouse material
B. Two lime/dolomite storage silos equipped with a fabric filter baghouse(s)
C. Four storage silos for carbon, each equipped with a baghouse filter

II.A.8 **Scrap/scrap substitute handling operations**

II.A.9 **Slag stockpiles**

The stockpiles are listed for informational purposes only

II.A.10 **Alloy unloading and storage**

II.A.11 **Billet reheat furnace #1**

Furnace is natural gas/propane fired with low NO_x burner
Burner rating 0.090 lb NO_x/MMBTU

II.A.12 **Billet reheat furnace #2**

Furnace is natural gas/propane fired with ultra-low NO_x burner
Burner rating 0.075 lb NO_x/MMBTU

II.A.13 **Water desalination plant**

Plant wide water treatment

II.A.14 **Associated mobile equipment**

This equipment is listed for informational purposes only.

II.A.15 **Miscellaneous parts washers**

II.A.16 **Sandblast station(s)**

II.A.17 **Evaporative cooling towers**

Evaporative cooling towers arrangements for 5 water systems.

II.A.18 **Lime, fluorspar, charge carbon, and alloy handling**

II.A.19 **Miscellaneous gas fired equipment**

Miscellaneous plant wide natural gas/ propane cutting torches and burners that are rated less than 1,000,000 Btu/hour each.

This equipment is listed for informational purposes only.

II.A.20 **Hot steel rolling operations**

Operations are equipped with baghouses venting indoors

II.A.21 **Scrap steel stockpiles**

This equipment is listed for informational purposes only

II.A.22 **Fuel storage tanks**

Diesel and gasoline fuel storage tanks less than 19,812 gallons.

II.A.23 **Generators and pumps**

Miscellaneous diesel, natural gas and propane fueled emergency generators and pumps.

II.A.24 **Di-ethylene glycol storage tank**

II.A.25 **Paint Dip Line**

II.A.26 **Roll Mill 1**

Mill Baghouse vented to atmosphere
Jump Mill Baghouse vented to the atmosphere
Abrasive Saw Shack Baghouse vented to the atmosphere
Roll Mill Heat Retention Boxes equipped with natural gas burners

II.A.27 **Unpowered ladle stir stations/Powered LMFs**

II.A.28 **Ladle vacuum degasser equipped with flare**

Burner rating 0.005 lb NO_x/ton

II.A.29 **EAF hydraulics**

Natural gas fired engines for hydraulics.

II.B Requirements and Limitations

II.B.1 **<u>Limitations and Test Procedures</u>**

II.B.1.a Nucor shall notify the Director in writing when the following equipment or operations listed in Condition II.A have been installed and are operational:

A. Alloy unloading station
B. Abrasive Saw baghouse
C. Jump Mill baghouse
D. Roll Mill 1 baghouse
E. Rolled product natural gas burner assisted heat retention boxes
F. Three emergency generators
G. Conversion of ladle stir stations to electrically powered LMFs
H. A ladle vacuum degasser
i. Increase flow rate through the baghouse
J. Emergency natural gas fired engines for EAF hydraulics

To ensure proper credit when notifying the Director, send your correspondence to the Director, attn: Compliance Section.

If Nucor has not notified the Director in writing within 18 months from the date of this AO on the status of the construction and/or installation, the Director shall require documentation of the continuous construction and/or installation of the operation. If a continuous program of construction and/or installation is not proceeding, the Director may revoke the AO. [R307-401-18]

II.B.1.b Emissions to the atmosphere at all times from the indicated emission point(s) shall not exceed the following rates and concentrations*:

Source: EAF Baghouse

Pollutant	lb/hr	grains/dscf (68ºF, 29.92 in Hg)	tons/year
TSP (filterable)	27.0	0.0030	
PM_{10} (filterable)	21.6	0.0018	
$PM_{2.5}$ (filterable)	21.1	0.00176	
$PM_{2.5}$ (condensibles)	29.53		
SO_2 (3-hr ave)	93.98		
SO_2 (24-hr ave)	89.0		
SO_2 (rolling 12-month total)			322
NO_x (rolling 12-month total)			245
CO (1-hr ave)	1,200		
CO (8-hr ave)	682.93		
CO (rolling 12-month total)			2,800
VOC	22.20		

Source: Reheat Furnace #1

Pollutant	lb/hr
NO_x	15.0

Source: Reheat Furnace #2

Pollutant	lb/hr
NO_x	8.0

*For particulate emission limits where dual limits are listed, both limits apply. [R307-401]

II.B.1.c Stack testing to show compliance with the emission limitations stated in the above condition shall be performed as specified below:

A.

Emissions Point	Pollutant	Test Frequency
EAF Baghouse		
	TSP	Every year
	PM_{10}	Every year
	$PM_{2.5}$	Every year
	PM Condensibles	Every year
	SO_2	CEM
	NO_x	CEM
	CO	CEM
	VOC	Every 5 years
Reheat Furnace #1		
	NO_x	Every 3 years
Reheat Furnace #2		
	NO_x	Every 3 years

B. Testing Status

PM_{10} and PM 2.5 (filterable) compliance may be demonstrated through TSP testing. If the TSP emissions are below the PM_{10} and $PM_{2.5}$ limit, then that will constitute compliance with the TSP limit. If the TSP emissions are not below the PM_{10} limit, testing will be required. If required, this test will be completed within 120 days of the yearly TSP test.

CEM compliance shall be demonstrated through use of a Continuous Emissions Monitoring System (CEM) as outlined in Condition #II.B.4.a below. The CEM that is used to determine compliance shall be operated according to the most recent Title V permit.

C. Notification

The Director shall be notified at least 30 days prior to conducting any required emission testing. A source test protocol shall be submitted to DAQ when the testing notification is submitted to the Director.

The source test protocol shall be approved by the Director prior to performing the tests. The source test protocol shall outline the proposed test methodologies, stack to be tested, and procedures to be used. A pretest conference shall be held, if directed by the Director.

D. Sample Location

The emission point shall be designed to conform to the requirements of 40 CFR 60, Appendix A, Method 1, or other methods as approved by the Director. An Occupational Safety and Health Administration (OSHA) or Mine Safety and Health Administration (MSHA) approved access shall be provided to the test location.

E. Volumetric Flow Rate

40 CFR 60, Appendix A, Method 2 or other testing methods approved by the Director

F. TSP

40 CFR 60. Appendix A, Method 5D. The minimum sample time and sample volume shall be four hours and 160 dscfm.

G. PM_{10}

The following methods shall be used to measure filterable particulate emissions: 40 CFR 51, Appendix M, Method 201 or Method 201A, or other EPA-approved testing method, as acceptable to the Director. If other approved testing methods are used which cannot measure the PM_{10} fraction of the filterable particulate emissions, all of the filterable particulate emissions shall be considered PM_{10}.

The condensable particulate emissions shall not be used for compliance demonstration, but shall be used for inventory purposes.

H. $PM_{2.5}$

The following methods shall be used to measure filterable particulate emissions: 40 CFR 51, Appendix M, Method 201A, or other EPA-approved testing method, as acceptable to the Director. If other approved testing methods are used which cannot measure the $PM_{2.5}$ fraction of the filterable particulate emissions, all of the filterable particulate emissions shall be considered $PM_{2.5}$. The portion of the filterable particulate emissions considered $PM_{2.5}$ shall be based on information in Appendix B of the fifth edition of the EPA document, AP-42, or other data acceptable to the Director.

The following methods shall be used to measure condensible particulate emissions: 40 CFR 51, Appendix M, Method 202, or other EPA-approved testing method, as acceptable to the Director.

Both the filterable particulate emissions and the condensible particulate emissions shall be used for compliance demonstration.

I. Nitrogen Oxides (NO_x)

40 CFR 60, Appendix A, Method 7, 7A, 7B, 7C, 7D, 7E, or other EPA approved testing methods acceptable to the Director.

J. Volatile Organic Compounds (VOCs)

VOC emissions shall be determined by simultaneously using 40 CFR 60, Appendix A, Method 25A (total organic gaseous concentration) with two analyzers, with one analyzer configured to read only methane. The difference between the total organic detector and the methane detector shall constitute the VOC measurement.

K. Carbon Monoxide (CO)

40 CFR 60, Appendix A, Method 10, or other EPA approved testing methods acceptable to the Director.

L. Calculations

To determine mass emission rates (lb/hr, etc.) the pollutant concentration as determined by the appropriate methods above shall be multiplied by the volumetric flow rate and any necessary conversion factors determined by the Director, to give the results in the specified units of the emission limitation.

M. Existing Source Operation

For an existing source/emission point, the production rate during all compliance testing shall be no less than 90% of the maximum production achieved in the previous three years. [R307-401]

II.B.1.d Visible emissions from the following emission points shall not exceed the following values:

A. Emissions from the shop and due solely to operations of any electric arc furnaces - 6%

B. Exhaust of the EAF baghouse - less than 3%

C. EAF dust handling equipment - less than 10%

D. Carbon storage silo baghouse exhaust - 10%

E. Lime/dolomite storage silo exhaust - 10%

F. Roll Mill baghouse - 10%

G. Unpaved haul roads and service roads - 20%

H. Paved haul roads and service roads - 10%

I. Additive (coke breeze, feldspar, alloys, lime, etc.) batching operations - 10%

J. Reheat Furnace #1 and #2 - 10%

K. Sandblasting - 40%

L. All other points - 20%

Opacity observations of emissions from stationary sources shall be conducted according to 40

CFR 60, Appendix A, Method 9.

In lieu of monitoring via visible emission observations for Reheat Furnace #1 and #2, fuel usage shall be monitored to demonstrate that only natural gas or propane is being used as fuel. Results of monitoring for Reheat Furnace #1 and #2 shall be maintained in accordance with R307-415-6a(3)(b). [R307-201]

II.B.1.e The minimum number of EAF baghouse fans to be operated is the number of operating fans used in NSPS Subpart AAa initial performance demonstrations. [R307-401]

II.B.1.f Nucor shall install, calibrate, and maintain one of the following systems to verify that emission control systems are operating within established parameters:

A. Fan ampere and damper setting system

This system shall provide records of fan operation and amperes with readings taken once per shift and provide a fan operation log that records excursion events such as fan shut downs and startups. Required fan amperes and damper positions shall be those established during an initial compliance test where compliance with emission (including opacity) limitations was demonstrated. The records shall be made available to the Director upon request.

B. Continuous volumetric monitoring device

This system will provide a continuous record of airflow in all ducts evacuating the EAF and roof canopy. The monitoring devices may be installed in any location in the exhaust ducts such that reproducible flow rate monitoring will result. The flow rate monitoring device(s) shall have an accuracy of plus or minus 10% over its normal operating range and shall be calibrated according to manufacturer's instructions. The Director may require Nucor to demonstrate the accuracy of the monitoring device(s) according to method 1 and 2, Appendix A, 40 CFR 60. Required airflows will be those established during an initial compliance test where compliance with emission (including opacity) limits was demonstrated. The records shall be made available to the Director upon request.

C. Negative pressure monitoring system

This system will consist of a monitoring device that continuously records the negative pressure in each duct for all ducts used to evacuate emissions from the EAF(s). The pressure shall be recorded as 15-minute integrated averages. The monitoring devices shall be installed in any appropriate location in the ducts such that reproducible results are obtained and shall be upstream of any damper in the duct. The pressure-monitoring device shall have an accuracy of plus or minus five (5) mm of water gauge over its normal operating range and shall be calibrated according to the manufacturer's instructions.

Measurements of the minimum negative pressure recorded during the initial performance test of condition II.B.1.c above for each duct shall be the minimum allowed negative pressure during the charging, melting, and tapping stages for each furnace. Nucor shall maintain a log of the negative pressures in integrated 15-minute averages of each furnace during all stages. The log shall be made available to the Director or Director's representative upon request.

Nucor shall establish the parameters during the initial compliance test(s) and shall submit the parameters to the Director for approval. Nucor shall operate the emission control systems within the approved parameters. [R307-401]

II.B.1.g Nucor shall perform visible emission observations of emissions from the EAF baghouse with a certified observer. Observations shall be conducted at least once per day when at least one of the furnaces is operating in the melting/refining stage. These observations shall be taken in accordance with Method 9, and for at least three six-minute periods. Records of daily observations shall be maintained on site. [R307-401]

II.B.1.h The melt shop operation shall not exceed 8,300 hours of operation per rolling 12-month period.

Monitoring:

Nucor shall calculate, by the twentieth day of each month, a 12-month total based on the first day of each month using data from the previous 12 months. Hours of operation shall be determined by supervisor's monitoring and maintenance of a daily operations log.

Recordkeeping:

Results of monitoring shall be maintained in accordance with Condition I.3 of this permit. [R307-401]

II.B.1.i Nucor shall perform monthly operational status inspections of the equipment that is important to the performance of the EAF emissions total capture system. The inspections shall include all ducting, dampers, switches, etc. This inspection shall include observations of the physical appearance of the equipment (e.g. presence of holes in the ductwork or canopy, flow constrictions caused by dents or accumulation of dust in the ductwork, and fan erosion). Any deficiencies shall be noted and proper maintenance performed. Records of the results of the monthly inspections and maintenance/repairs performed shall be maintained. [R307-401]

II.B.1.j Emergency generators and pumps shall only be used during the periods when electric power is interrupted and/or during maintenance. Records documenting generator and/or pump usage shall be kept in a log and they shall show the date the generator and/or pump was used, the duration in hours that the generator and/or pump was used, and the reason for each generator and/or pump usage. [R307-401]

II.B.2 **<u>Roads and Fugitive Dust</u>**

II.B.2.a All unpaved roads and other unpaved operational areas that are used by mobile equipment shall be water sprayed and/or chemically treated to control fugitive dust. Treatment shall be of sufficient frequency and quantity to maintain the surface material in a damp/moist condition.

The opacity shall not exceed 20% during all times the areas are in use or unless it is below freezing. Records of water treatment shall be kept for all periods when the plant is in operation. The records shall include the following items:

A. Date

B. Number of treatments made, dilution ratio, and quantity

C. Rainfall received, if any, and approximate amount

D. Time of day treatments were made

Records of treatment shall be made available to the Director upon request, and shall include a period of two years ending with the date of the request. [R307-401]

II.B.2.b The paved haul roads and operational areas shall be periodically swept or water-flushed-clean as conditions warrant or as determined necessary by the Director. Records of cleaning paved roads shall be made available to the Director or Director's representative upon request. Records shall include a period of two years before the date of request. [R307-401]

II.B.2.c There shall be no active exterior coke breeze, and feldspar stockpiles located at the Nucor manufacturing site. [R307-401]

II.B.2.d Water sprays shall be installed to ensure all conveyor transfer points and batching equipment drop points are adequately controlled for fugitive emissions:

An alternative to water sprays for items listed above may be to enclose the transfer/drop points. The sprays shall operate whenever dry conditions warrant or as determined necessary by the Director. [R307-401]

II.B.3 **Fuels**

II.B.3.a Nucor shall use only natural gas or propane as a fuel in the steel making processes and comfort heating. The plant-wide consumption of natural gas at the steel plant shall not exceed 2,340,000,000 scf per year and propane shall not exceed 2,800,000 gallons per year, not including fuel consumed by oxy-fuel burners for the two EAFs. Nucor shall install a meter or meters, which measure the amount of natural gas consumed by the EAF oxy-fuel burners. Nucor shall install a meter, which measures the volume of propane-consumed plant wide. Compliance with the annual limitations shall be determined on a rolling 12-month total. Consumption of natural gas shall be determined by the last 12 vendor billing statements with the appropriate conversion of acf to scf, as recommended by the vendor, and subtracting from the statements the amount of fuel consumed by the EAF oxy-fuel burners. Consumption of propane shall be determined by records of propane consumed at the steel making plant, by Nucor's meters. [R307-401]

II.B.3.b The plant wide consumption of diesel fuel by on-site equipment at the steel making plant, both mobile and stationary, shall not exceed 285,000 gallons per rolling 12-month period. Compliance with the annual limitation shall be determined on a rolling 12-month total. Consumption of diesel fuel shall be determined by the last 12 vendor billing statements. [R307-401]

II.B.3.c The sulfur content of any fuel oil or diesel burned shall not exceed 0.0015 percent by weight. Nucor must maintain a fuel specification certification document from the fuel supplier with the sulfur content guarantee. Alternatively, sulfur content may be verified through testing completed by Nucor or the fuel supplier using ASTM Method D-4294-10 or approved equivalent. [R307-401]

II.B.4 **Monitoring - Continuous Emissions Monitoring**

II.B.4.a Nucor shall install, calibrate, maintain, and operate a CEM system on EAF baghouse exhaust stacks. Nucor shall record the output of the system, for measuring the NO_x emissions, SO_2 emissions, and CO emissions. The monitoring system shall comply with all applicable sections of R307-170 and 40 CFR 60, Appendix B.

Except for system breakdown, repairs, calibration checks, and zero and span adjustments required under paragraph (d) 40 CFR 60.13, Nucor shall continuously operate all required continuous monitoring systems and shall meet minimum frequency of operation requirements as outlined in 40 CFR 60.13 and Section R307-170. [R307-401]

II.B.5 **VOC Limitations**

II.B.5.a The emissions of VOC at the Nucor mill plant from miscellaneous solvent, cleaners (excluding janitorial), and painting shall not exceed 30.64 tons per 12-month period. The plant wide emissions of VOC from the steel mill plant shall be determined by maintaining a record of VOC potential contained in the materials used each month. [R307-401]

Section III: APPLICABLE FEDERAL REQUIREMENTS

In addition to the requirements of this AO, all applicable provisions of the following federal programs have been found to apply to this installation. This AO in no way releases the owner or operator from any liability for compliance with all other applicable federal, state, and local regulations including UAC R307.

NSPS (Part 60), A: General Provisions
NSPS (Part 60), AA: Standards of Performance for Steel Plants: Electric Arc Furnaces Constructed After October 21, 1974, and On or Before August 17, 1983
NSPS (Part 60), IIII: Standards of Performance for Stationary Compression Ignition Internal Combustion Engines

NSPS (Part 60), JJJJ: Standards of Performance for Stationary Spark Ignition Internal Combustion Engines
MACT (Part 63), A: General Provisions
MACT (Part 63), ZZZZ: National Emissions Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines
MACT (Part 63), YYYYY: National Emission Standards for Hazardous Air Pollutants for Area Sources: Electric Arc Furnace Steelmaking Facilities
MACT (Part 63), CCCCCC: National Emission Standards for Hazardous Air Pollutants for Source Category: Gasoline Dispensing Facilities
Title V (Part 70) major source

REVIEWER COMMENTS

The AO will be based on the following documents:

Supersedes	DAQE-AN100080031-13 dated March 18, 2013
Incorporates	Notice of Intent dated June 25, 2012
Incorporates	Additional Information dated February 14, 2013
Incorporates	Additional Information dated February 27, 2013
Incorporates	Additional Information dated March 1, 2013
Incorporates	Additional Information dated April 18, 2013
Incorporates	Additional Information dated April 16, 2013
Incorporates	Additional Information dated April 13, 2013
Incorporates	Additional Information dated April 7, 2013
Incorporates	Additional Information dated April 4, 2013
Incorporates	Additional Information dated March 9, 2013

1. Comment regarding Plant Modifications:
   Since the previous PSD permit, Nucor has been performing a continuous construction/installation of the modifications as allowed by the following language in the existing permit:

   > The furnaces may be modified by installation of eccentric bottom tap(s); sidewall and door oxygen lance burner technologies and/or door lancing technologies; alterations in furnace movements and components, computer control equipment, refractories, and alterations to raw material feeds such as alloy addition, and support equipment modifications such as charge bucket, ladle, crane, and building modifications, to increase production rates, not to exceed AO production limits and emission limits.

   These processes were approved through the DAQ NSR and Title V permitting programs. The furnace bowls and shells have been modified, computer control equipment has been regularly updated and the programs that control raw material inputs and energy inputs are frequently modified. Transformers supplying power and associated electrical power lines have been updated. Ladle stir station(s) have been added adjacent to the furnaces and used as the primary location for finishing of various heats, in place of the historic stir station located at the caster. The stir station will remain in place as a backup. Systems used to add alloys and fluxing agents (CaO and MgO) have been modified. Natural gas burners in the furnaces have been relocated or aimed differently inside the furnace to increase efficiency of applying the natural gas consumed.

   The caster has been modified by installing a ladle turret in place of a ladle rail system to better be able to stage ladles. Crane motor systems have been modified to allow improved cooling for an improved up-time. Ladles and charge buckets have been modified to improve efficiency of placing scrap steel in the furnace and to increase amount of liquid steel that may be transferred from the furnaces to the caster.

   Nucor has also modified drafting inside the building and venting by sealing the caster ventilator and using the ventilator as ductwork to capture caster emissions and direct them to the electric arc furnace canopy capture system, which directs emissions to the EAF baghouse. Large interior air curtains have been installed to better contain emissions to a smaller area to more efficiently transfer arc furnace emissions to the baghouse. Localized evacuation ducts tied to the EAF baghouse system have been installed at the ladle stir station to more efficiently capture emissions from the stirring operations. [Last updated April 12, 2013]

2. Comment regarding Plant Modifications Continued:
Nucor's proposal includes physical changes to the EAF baghouse system to increase flows. The flow rate was 700,000 dscfm and will now be increased to a peak flow rate of 1,400,000 dscfm. These changes may include fan upgrades, and/or baghouse expansion, for the purposes of increasing the exchange rate of indoor air inside the meltshop. This will reduce the uncontrolled fugitive emissions in the meltshop. A baghouse flow improvement project will increase the emissions from the baghouse for all criteria pollutants. This improvement will decrease the fugitive emissions from the melt shop for criteria pollutants because the fugitive emissions will now be controlled. Further, since the PM component emissions are calculated based on volume flow rate through the baghouse, PM emissions increases will occur from the EAF baghouse stack. The back half consensible portion of particulate emissions was not included in Nucor's previous permits, but will now be included.
Minor modifications have been made which may include items of upgraded cooling water system components (valves, piping, pumping) for the furnaces and caster, better water system chemical management for decreased corrosion rates, and beefed-up components (ex. additional refractory or heavier steel) for the electric arc furnaces where failures have occurred in the past. All modifications are meant to increase reliability and availability of the melt shop equipment. [Last updated April 12, 2013]

3. Comment regarding EAF Baghouse Operation.:
The EAF baghouse currently operates at 700,000 dscfm. This was the flow rate verified during the 2011 stack test. The airflow will be increased to an average of 1,000,000 dscfm with a peak flow rate of 1,400,000 dscfm. This will increase the filterable PM emission rate from 25.07 to 27.0 lb/hr, and the filterable PM_{10} emission rate from 20.06 to 21.6 lb/hr The increase in emissions will result entirely from the increased flowrate. Gaseous pollutant emission rates, including $PM_{2.5}$, are unaffected by an increase in flow. Nucor permits have not previously contained a limit for the pollutant $PM_{2.5}$. Baseline emissions were calculated based on annual stack test data for total filterable PM (considered 100% PM_{10}) and the portion of those measured emission rates (97%) as $PM_{2.5}$ were found using AP42 tables. Emission rates for condensable $PM_{2.5}$ for both baseline and potential emissions are quantified by use of the BACT/LAER review completed for other similar sources with a combined condensable and filterable limit of 0.0052 grains/dscf determined appropriate. The condensable emission rate of 25.7 lbs per hour was applied to both the baseline and potential emission increases associated with the propsed increase in hours of operation. The PM concentration through the baghouse will remain the same. Previous permits contained lb per hour limitations for PM and PM_{10}. The draft permit contains lb/hr limitations and further contains grain loading concentration limits. Concentrations limits of PM will be at 0.0030 grains/dscf (NSPS requires 0.0052) and PM_{10} will be 0.0018 grains/dscf. The current permit did not have a filterable or condensable $PM_{2.5}$ emission limit and this modification will set the filterable $PM_{2.5}$ emission limit at 21.1 lb/hr and 0.00176 grains/dscf and the condensable $PM_{2.5}$ at 29.53 lbs/hr. [Last updated April 15, 2013]

4. Comment regarding Offsets:
40 CFR Part 51 subpart Appendix S requires that when a major source increases their $PM_{2.5}$ emissions by 10 tons per year or more in a $PM_{2.5}$ nonattainment area, that they are required to obtain offsets. The last PSD permit issued to Nucor was in 2007. The emissions from the EAF baghouse for the 2007 PSD permit and all subsequent permits were calculated based on a flow rate

of up to 950,000 dscfm. Nucor has made recent improvements to the baghouse which has increased flows to averages of approximately 800,000 dscfm by tuning cleaning cycles and by installing high efficiency bags. Flowrates found in baseline years included in the PSD application were approximately 700,000 cfm as measured during partuclate stack tests each of the baseline years. Nucor proposes to increase flows over the rates previously addressed in their prior PSD application by installation of high efficiency fan wheels. Any average flow increase greater than 950,000 cfm is an increase in emissions requiring the new permit. Nucor is increasing their $PM_{2.5}$ emissions over baseline years by 108.46 tpy and their SO emissions by 286.25 tpy. Offsets will be required as follows:

Increase in monthly average EAF baghouse flows greater than 950,000 dscfm: $PM_{2.5}$ 108.46 tpy

Increase in Meltshop hours greater than 8200 hours, installation of a powered ladle station, vacuum degasser: SO_2 = 286.25 and $PM_{2.5}$ = 108.46 tpy (if not already obtained for the EAF baghouse flow upgrade). [Last updated April 15, 2013]

5. Comment regarding Offsets Continued:
Nucor completed a thorough review of their operations and identified sources that have not been included in the emission inventory. The newly inventoried sources include material handling or small stockpiles which represent PM 10 emissions. The latest AP42 emission factors were applied to these new sources. Nucor also included emission calculations for the caster steam vent, a PM emission source not previously recognized as a potential source of emissions. Emission estimates for the steam vent were based on test data of a caster steam vent at a Nucor Steel operation in another state. Combined, all newly identified emission sources represent potential PM_{10} emissions of less than 1 tpy.
Changes in emission factors include updated emission calculations for meltshop operations. With this Notice of Intent, Nucor reduced the estimated capture efficiency of emissions within the meltshop from a previously estimated capture efficiency of >99% to a capture efficiency of 97%. A 97% capture efficiency is typical of a capture efficiency used in permitting at other Nucor mills, and is included in previous versions of AP42. More recent versions of AP42 do not include estimates of capture efficiency. The revised emission factor was used in both potential and baseline calculations, resulting in a greater quantity of emission increases to address associated with a production increase. Noted is that Nucor has made modifications to ventilators over the casting operations by sealing them off and directing casting emissions to the baghouse through the use of fans. This emission reduction was not credited in the netting process associated with this application (assumed these emissions did not exist in the baseline), though previous applications identified these emissions.

Other changes in emission factors include:

Material Handling and Storage Pile Emissions – Utilize onsite measured data (years 2007-2008) for wind speed. In previous applications, the wind speed was estimated. Utilize updated emission factors from AP42 that were issued prior to the previous PSD application submitted to Nucor.

Cooling Towers - Nucor provided a detailed documentation of studies completed on cooling towers. Emission factors developed through this study were used for emission calculations.

Paved and Unpaved Roads - Both emission factors in AP-42 have been updated since the previous PSD application submitted by Nucor. With this application, Nucor completed vehicle

counts of trucks and passenger traveling on various segments of paved and unpaved roadways. The vehicle counts were then tied to existing production levels if production dependent, or remained constant if not production dependent (ex. vendor and employee passenger vehicles). The counts were applied to the appropriate production levels. Previous calculations were based on the same process completed years earlier. Since that time the vehicle counts relative to production, the interior destination points, and whether a road is paved or unpaved have been modified.
In all cases of emission factor changes, the updated emission factors were applied to both baseline emissions and potential emissions to provide the most accurate netting calculations as possible. [Last updated April 15, 2013]

6. Comment regarding PSD Applicability:
The existing steel mill is defined as a major source under the PSD regulations. These regulations, amended by the U.S. Environmental Protection Agency (USEPA) on August 7, 1980 (45 FR 52675) and December 31, 2002 (67 FR 80186), specify that any major new stationary source or major modification to an existing major source within an air quality attainment area must undergo a PSD review and obtain all applicable federal and state preconstruction permits prior to commencement of construction. For new sources, the regulations apply to:

1.Any source type in any of 28 designated industrial source categories having potential emissions of 100 tons per year or more; and
2.Any other source having potential emissions of 250 tons per year or more of any pollutant regulated under the Clean Air Act.

"Potential emissions" are defined as the emissions of any pollutant at maximum design capacity (or less than maximum design capacity if specified as a permit condition), including the control efficiency of air pollution control equipment. For modifications of existing sources, the regulations apply if the existing source is major (as defined above) for any criteria pollutant and the modification results in increased emissions of any criteria pollutant exceeding the PSD significant emission limits. PSD review generally consists of:

1.A case-by-case Best Available Control Technology (BACT) demonstration, taking into account energy, environmental, and economic impacts as well as technical feasibility;
2.An ambient air quality impact analysis to determine whether the allowable emissions from the proposed modification, in conjunction with all other applicable emission increases or reductions, would cause or contribute to a violation of the applicable PSD increments and National Ambient Air Quality Standards (NAAQS);
3.An ambient air quality monitoring program for up to 1 year;
4.An assessment of the direct and indirect effects of the modification on general growth, soil, vegetation, and visibility; and
5.Public comments, including an opportunity for a public hearing.

An applicant may be exempt from the ambient air quality monitoring requirement if there are existing air quality monitoring data representative of the site, or if the impact from the proposed modification is less than the monitoring de minimis concentrations. [Last updated April 15, 2013]

7. Comment regarding BACT Analysis:
A BACT analysis was not required for all of the processes at the Nucor site. Nucor conducted a BACT review for most sources at their site. These BACT reviews were not included in this

Source Plan Review. [Last updated April 17, 2013]

8. Comment regarding VOC Emissions:
The VOC PTE at the Nucor site is 139 TPY. This includes the 28.89 TPY limit from painting, solvent and cleaners. The majority of the VOC emissions come from the processing of scrap material in the EAF. The EAF has a VOC potential calculated at 97 TPY. Fugitives from other operations including the meltshop and reheat furnaces make the remainder of the 139 TPY PTE. [Last updated April 25, 2013]

ACRONYMS

The following lists commonly used acronyms and associated translations as they apply to this document:

40 CFR	Title 40 of the Code of Federal Regulations
AO	Approval Order
BACT	Best Available Control Technology
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CDS	Classification Data System (used by EPA to classify sources by size/type)
CEM	Continuous emissions monitor
CEMS	Continuous emissions monitoring system
CFR	Code of Federal Regulations
CMS	Continuous monitoring system
CO	Carbon monoxide
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent - 40 CFR Part 98, Subpart A, Table A-1
COM	Continuous opacity monitor
DAQ	Division of Air Quality (typically interchangeable with UDAQ)
DAQE	This is a document tracking code for internal UDAQ use
EPA	Environmental Protection Agency
FDCP	Fugitive dust control plan
GHG	Greenhouse Gas(es) - 40 CFR 52.21 (b)(49)(i)
GWP	Global Warming Potential - 40 CFR Part 86.1818-12(a)
HAP or HAPs	Hazardous air pollutant(s)
ITA	Intent to Approve
LB/HR	Pounds per hour
MACT	Maximum Achievable Control Technology
MMBTU	Million British Thermal Units
NAA	Nonattainment Area
NAAQS	National Ambient Air Quality Standards
NESHAP	National Emission Standards for Hazardous Air Pollutants
NOI	Notice of Intent
NO_x	Oxides of nitrogen
NSPS	New Source Performance Standard
NSR	New Source Review
PM_{10}	Particulate matter less than 10 microns in size
$PM_{2.5}$	Particulate matter less than 2.5 microns in size
PSD	Prevention of Significant Deterioration
PTE	Potential to Emit
R307	Rules Series 307
R307-401	Rules Series 307 - Section 401
SO_2	Sulfur dioxide
Title IV	Title IV of the Clean Air Act
Title V	Title V of the Clean Air Act
TPY	Tons per year
UAC	Utah Administrative Code
UDAQ	Utah Division of Air Quality (typically interchangeable with DAQ)
VOC	Volatile organic compounds